Performance of Seismic Arrays in the Presence of Weathering Layer Variations

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Abstract

Near-surface layer variations can degrade the desired response of seismic arrays which are typically used to attenuate horizontally traveling coherent noise and enhance vertically traveling signal. We investigate the effect of variations in the near-surface layer thickness on the performance of arrays by studying their impulse and wavelet responses. The models considered include the topographic variations and a channel in the base of weathering layer. The topographic variations include a dipping surface layer as well as a surface layer that follows a sine wave. The geological channel is assumed to be present under the entire receiver array as well as partially under a few receivers. We use Ricker wavelet and model plane wavefronts with incidence angles (90^o, 70^o, 45^o, 20^o and 5^o) on a 12-element equally weighted array for the weathering layer models. We found that the array responses are more degraded for near-vertically travelling waves in all cases. The array responses are also found to be more degraded when channel variations are present underneath a few receivers as compared to the entire array length.